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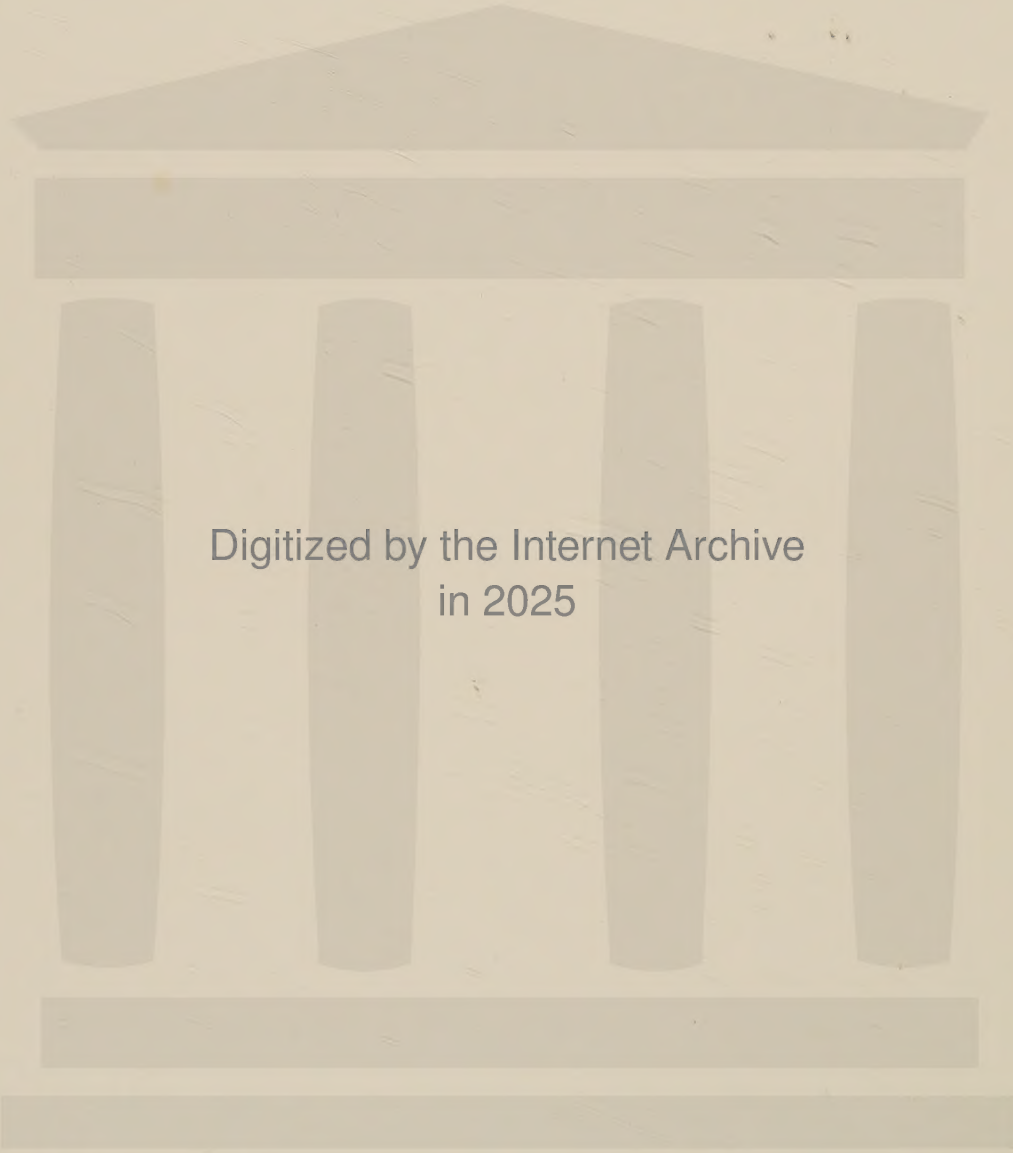
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SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - AUGUST 1976

RESEARCH HIGHLIGHTS

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HONOLULU LABORATORY
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MONTHLY REPORT - AUGUST 1976

STATUS OF PUBLICATIONS

Published

Kato, S. and J. Hardwick. 1976. The California squid fishery. Proceedings FAO Conference, Tokyo, Japan, Sept. 9-13, 1975.

This report provides an historical description of the California fishery for Loligo opalescens, with particular emphasis on fishing methods. Aspects of the life history and population structure of L. opalescens are also discussed.

Approved by Center Director

Perrin, William F., David B. Holts and Ruth B. Miller. "Growth and reproduction of the eastern spinner dolphin, a geographical form of Stenella longirostris in the eastern tropical Pacific." For publication in the Fishery Bulletin, U.S.

de la Campa de Guzman, Sara, Martha A. Padilla Garcia and Paul E. Smith. "Estimaciones de biomasa de reproductores de sardina Monterrey (Sardinops sagax), a traves de censos larvales, Golfo de California temporada 1974-1975." For publication in Contribution al Simposio de Recursos Masivos Instituto Nacional de Pesca, Mexico, 1976.

Hobson, E. S. "Aggregating as a defense against predators in aquatic and terrestrial environments." (For Chapter in book entitled Contrasts in Behavior, edited by E.S. Reese, Wiley-Interscience Publ.).

This report does not constitute publication and is for information only.

EXTENDED JURISDICTION

SWFC Extended Jurisdiction Activities Related to the Pacific Fishery Management Council

Mr. David Mackett, Southwest Fisheries Center Planning Officer, reported that the Center was authorized to conduct two socio-economic studies relative to extended jurisdiction activities. Drs. Huppert and Stauffer conferred with staff members from the NMFS Southwest Region, the California Department of Fish and Game, and the Honolulu Laboratory in finalizing specifications for two contract studies:

- 1) A study to evaluate the economics of an offshore fishery for anchovy and jack mackerel. This study will focus on cost and earnings of the commercial fleet, feasibility of alternative fishing gear (mid-water trawl), costs of processing capacity expansion, and prospects for expanding U.S. production under extended jurisdiction.
- 2) The second study focuses upon the bio-economics and optimal management criteria for utilization of Pacific billfish. Specifically, the Kailua-Kona billfish fishery in Hawaii, both recreational and the small commercial operations are to be surveyed, and a comprehensive profile of the fishery will be compiled. Principal emphasis will be on determining the relative importance of billfish as a sportfish for Hawaiian tourists.

Mr. Mackett also noted that a substantial amount of effort is being directed to acquire and analyze existing data for a "briefing document" on southern California market species. To be included in the "market" category are: barracuda, croaker, grouper, California halibut, rockfishes, sea basses (white, black, giant, totuava), shark, yellowtail and a few other minor species. Descriptive material covering historical catches, stock locations, profile of the fleet, and economic value is being compiled from California Department of Fish and Game data and publications. To augment the published information Drs. Huppert and Stauffer consulted with CF&G personnel at the Long Beach office on August 18 and 19.

Task to Prepare Preliminary Management Plans for Key Fishery Management Units Under Extended Jurisdiction Nears Completion

During the month, Honolulu Laboratory personnel completed working drafts of Preliminary Management Plans (PMP) for Pacific billfishes, precious corals, and seamount fishery resources. Fishery Biologist Howard Yoshida assembled background information on the pelagic armorhead, Pentaceros richardsoni, and alfonsin, Beryx splendens, resources within and near the 200-mile zone around the Hawaiian Islands. Dr. Jerry Wetherall, coordinator of the task to prepare the PMP's, wrote the overall plans and environmental assessments.

The working drafts were distributed for comment to key people in the recreational and commercial fisheries, to members of the Western Pacific Council, and to NMFS personnel in the Washington office and in the Northwest and Southwest Regions.

Dr. Wetherall and Dr. Paul Struhsaker attended a 2-day meeting of NMFS and Coast Guard personnel at the Honolulu Laboratory to provide background information on a preliminary management policy for the three fishery management units. The meetings were chaired by Mr. Perry Allen of the NMFS Washington Enforcement Division. The purpose of the meetings was to assemble information needed to allocate personnel, equipment, and money to the enforcement task in the Western Pacific Region.

Dr. Wetherall also met with Mr. Robert Scott of the Washington office during the month to discuss progress and problems in completing the PMP's.

Future meetings were scheduled at the Honolulu Laboratory for September 1 and 2 to discuss the PMP's and fishery management policy on an informal basis with local billfish and precious coral interests.

HONOLULU LABORATORY

FISH-ENVIRONMENT INVESTIGATIONS

Preliminary Analysis of Sonic Tracking of Large Skipjack Tuna Started

Dr. Andrew Dizon, Leader of the Experimental Ecology of Tunas group, made preliminary analyses of data collected on R/V Townsend Cromwell, Cruise 76-04-71. The cruise goals were to continuously monitor swimming activity of large skipjack tuna (> 7 kg). Distance traveled and depth were of primary importance. These data are pertinent to determination of energy budgets and to a hypothesis which states that the duration of a skipjack tuna can remain in the upper mixed layer is dependent upon its size, activity, and temperature.

Large skipjack tuna were tagged and released from the M/V Anela, a Hawaiian skipjack tuna vessel. The tags were cylindrical sonic transmitters, 16 mm in diameter, and 92 mm long, which transmitted pulses at a frequency of 48 kHz. Pulse rates were dependent on depth. The Cromwell's CTFM sonar was used as our receiving system. The tracking system had an approximate range of about 2 km.

Five skipjack tuna of about 70 cm fork length were tagged on separate occasions. The tag was inserted into the stomach via the mouth. Two of the fish regurgitated their tags, one immediately after release and the other in 2 hours. The other three were tracked for 11, 24, and 10 hours, respectively. Visual observation confirmed that at least two of the fish rejoined their schools after release, i.e., schools of large skipjack tuna were sighted where the sonic transmitter indicated the tagged fish to be.

The large skipjack tuna demonstrated a facility for rapid depth changes by swimming 100 m vertically in less than 2 minutes. Depths to about 270 m were observed in all three fish. Average depths of 141, 67, 232 m were recorded. No correlations between speed and depth of swimming were observed.

The average swim speed of the three fish was 1.74, 2.30, and 1.03 body lengths per second (bl/s). Speeds were determined from a vector generated from a horizontal component based on straight line calculations of half hour ship's position and a vertical component from depth measurements. The speeds thus are conservative since a horizontal vector is the shortest and consequently fastest path between each ship position. For the 24-hour tract, 45% of the time was spent swimming at less than 2.0 bl/s, 44% between 2.0 and 4.0 bl/s, and 11% at greater than 4.0 bl/s. Maximum speed for a single half hour interval was 6.1 bl/s or 7,791 m swum. The fastest average speed for 4 hours was 2.94 bl/s (S.D. = 0.50) at an average depth of 131 m (S.D. = 32). At 131 m the temperature was about 21°C. The lowest temperature encountered was about 12.5°C.

Depth seemed to be strongly correlated with light level. During the night, all three fish were found within 75 m of the surface. During the day fish ranged between the surface and depths of 270 m. The evening ascent was observed in all three fish. Average depths for each of the three during evening nautical twilight versus night were 235 versus 66 m (no moon), 115 versus 58 m (quarter moon), and 157 versus 61 m (quarter moon).

Five sonic transmitters are still available and plans are to resume skipjack tracking in October and December. Of particular interest will be the diurnal vertical movements and rates of diving. It has been hypothesized that negatively buoyant tunas can save energy by ascending rapidly and then gliding downward. This hypothesis should be verifiable by continuously recording depth information.

Studies Underway on Olfactory Responses of Tunas

Research is currently underway to ascertain if tunas respond to olfactory cues to an extent that it would be possible to separate yellowfin tuna from porpoises by chemosensory behavioral modification.

Bioassays are being made of the effects of prey scents on the swimming and feeding behavior of captive tuna. To date, responses to rinses from nehu have been observed in both kawakawa and yellowfin tuna. Increased swim speeds and rate of turning occur when the fish encounter an odor plume.

Most of July was spent in acquiring healthy animals and in the assembly of equipment needed for stimulus delivery and for monitoring and recording the fishes' behavior. Experimental procedures were established and feeding regimes worked out.

Two test tanks were equipped with multiple stimulus display tubes which will enable randomization of the odor introduction point. The tanks were marked with quadrats to assist in behavior quantification.

Videotape equipment was acquired on loan from the University of Hawaii and adapted for monitoring fish behavior from the observation tower. This system has proved excellent for data collection and recall and permits accurate analysis of fish behavior.

A range of prey rinses were prepared for use in the bioassay. Samples of the rinses are being subjected to amino acid analysis.

August was spent in streamlining all parts of the system and in initial characterization of the types of behavior that yellowfin tuna display in response to prey odors. Although the fish were quite slow in acclimating to captivity, consistent behavioral responses are emerging. Baitfish rinses cause increased swimming speed and departure from the normal cruising pattern that the fish exhibit when not aroused. Tight circling and feeding bars are occasionally displayed when the fish are in the vicinity of the odor cloud. Yellowfin tuna arousal is less dramatic than that shown by kawakawa but is readily recognizable. This behavior pattern has promise as an effective bioassay of the efficacy of odor mixes which will be tested during the rest of the program.

TUNA ASSESSMENT AND DEVELOPMENT INVESTIGATIONS

Coordinator Selected for Northwestern Hawaiian Islands Study

Dr. Robert Skillman, Fishery Biologist, was selected to be the coordinator for the cooperative, multidisciplinary study of the land and marine fauna of the Northwestern Hawaiian Islands (NWHI). The first preliminary survey and assessment cruise to the area was completed late in 1975 and a series of cruises to continue and expand the investigation is slated to begin in October. Dr. Skillman began his duties as coordinator by reviewing various documents relating to this cooperative

Federal/State study. A meeting of representatives from the various Federal and State agencies was held during the month to discuss 1) coordination of the marine mammal studies to be undertaken by the Northwest Fisheries Center (NWFC, 2) potential interaction between the NWFC's seamount resource study and a comparable study in NWHI in conjunction with extended jurisdiction (EJ), 3) lines of communication among participating agencies, and 4) to review a draft prospectus of the research proposal.

Report on Commercial Fishing Trials With Northern Anchovy Completed

Fishery Biologist Richard Uchida, who coordinated the recently completed sea trials on the efficacy of using northern anchovy in commercial fishing for Hawaiian skipjack tuna, completed a report, "Fishing skipjack tuna with northern anchovy in Hawaiian waters, July 20-22, 1976" (SWFC Administrative Report No. 6H, 1976). Briefly, Mr. Uchida's report indicated that of 21 schools chummed with anchovy, only 7 or 33% were successfully fished, whereas the usual rate of success with nehu, Stolephorus purpureus, the indigenous bait species in Hawaii, is about 50%. On a trip basis, the boats that fished with anchovy caught only 0.9 MT (metric ton) per trip while those fishing with nehu had catch rates nearly 2.5 times greater, averaging 2.3 MT per trip. Some boats that used a combination of nehu and anchovy appeared to have done quite well; their catches averaged 3.0 MT per trip. Despite poor catches with anchovy, most of the vessel captains were impressed with the holding qualities of the anchovy which survived well in the local boats' baitwells. Overall mortalities of northern anchovy were significantly less than for nehu. Several captains and crew members expressed an opinion that the results obtained with anchovy may have been very impressive if large, "season" fish (6.8-10.0 kg) had been plentiful in Hawaiian waters.

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With assistance from Dr. Wetherall, Dr. Skillman prepared summaries of Pacific Ocean billfish and tuna catches made by the Japanese tuna longline fleet and the multi-nation fleet operating out of Pago Pago, American Samoa. These summaries were prepared as background information for the U.S.-Japan fisheries negotiations to sign a Governing International Fisheries Agreement. Dr. Skillman departed Honolulu for Washington, D.C. to attend the meetings, which were held from August 17 to 31.

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Mr. Thomas Hida, Fishery Biologist, made arrangements to order and purchase supplies and materials for the fabrication of a platform for a baitfish holding pen. He also supervised the construction of the platform, which will be used in conjunction with the roll-on/roll-off baitfish project. Mr. Hida also served as an observer on a Coast Guard surveillance flight from Honolulu to Midway and Kure Island and back.

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Mr. Uchida attended a meeting of the ad hoc Baitfish Committee to report on the results of the first large-scale commercial test of northern anchovy as live bait, and drafted a summary report of the meeting. He also attended a "PEACESAT" session at the University of Hawaii to discuss skipjack tuna studies including some of the current research in New Zealand, the summer skipjack tuna trend in Hawaii, and research plans with regard to skipjack tuna tagging in the South Pacific. (PEACESAT is the name given to a satellite communication system to simultaneously connect various stations located in the Pacific island states). He received data on skipjack tuna length measurements, catch, fishing effort, bait catch, and baiting effort from the British Solomon Islands Protectorate (BSIP) and Papua New Guinea (PNG). Computer Aid Lucille Tsukano processed and keypunched the BSIP and PNG data. Mr. Uchida also served as Acting Administrative Officer for the period August 2 to 27.

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Dr. Paul Struhsaker, Fishery Biologist, and Mr. James Uchiyama, Research Assistant, worked on the preparation of some documents that will be included in the "proceedings" of the otolith workshop they recently attended. Dr. Struhsaker worked on a section on the validation of growth increment-day relation using holding experiments. Mr. Uchiyama drafted a section on otolith whole mount preparation, cross section preparation, counting methods, and validation of growth increment-day relation using marks caused by environmental factors. Mr. Uchiyama also extracted otoliths from carangids collected by Honolulu Laboratory and State Fish and Game personnel during the spring cruise of the Townsend Cromwell to the NWHI. He also arranged the shipping of albacore specimens from the F/V Typhoon to the La Jolla Laboratory and assisted Mr. Ray Sumida, Research Assistant, in shipping the Honolulu Laboratory's squid collection to Dr. Clyde Roper of the Smithsonian Institution.

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Revised Skipjack Tuna Landing Estimates for June 28 To July 25

The June 28 to July 25, 1976 catch of skipjack tuna in the Hawaiian fishery was estimated to be 348.2 MT, which is 65.5 MT above the catch for the same period in 1975 and 420.5 MT below the 1948 to 1975 long-term average. The catch from January through July 25 was estimated at 2,220.0 MT, 740.2 MT above last year's catch for the same period but 293.2 MT below the 1948 to 1975 average.

Hawaiian Skipjack Tuna Catches From July 26 To August 22 Remain Below Long-Term Average

The July 26 to August 22 catch was estimated at 421.6 MT, which is 170.1 MT above the 1975 catch for the same period but 243.2 MT below the 1948 to 1975 long-term average. The catch from January

through August 22 was estimated at 2,641.5 MT, which is 926.4 MT above last year's catch for the same period but 702.9 MT below the 1948 to 1975 long-term average.

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Pulou Niuatoa, an employee of the Government of American Samoa, recorded the lengths of 2,125 albacore from 43 vessels unloading at Pago Pago during the period June 2 to August 13. He also collected 49 sets of catch and effort data. Research Assistant Ray Sumida, utilizing data from 10 vessels, calculated an average size of 91.8 cm and a catch rate of 2.12 albacore per 100 hooks.

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LA JOLLA LABORATORY

Coastal Fisheries Resources Division

ALBACORE FISHERIES PROGRAM

Albacore Landings Down From 1975

According to Dr. Michael Laurs, Leader of the Albacore Fisheries Program at the La Jolla Laboratory, it was estimated that 7,500 tons of albacore have been landed from the North American west coast. Last year, the seasonal landings through August were 12,000 tons.

Commercial albacore boats were fishing in widely scattered areas, along the entire west coast during the last 2 weeks of August with catches continuing to be made from Cape St. James to Destruction Island, from Cape Blanco to Point Arguello, and in the vicinity of Guadalupe Island. The most consistent area of fishing was off central Baja California as daily jigboat catches were 30 to 150 fish per boat with top scores of approximately 300 fish on some days. Albacore landed from this area averaged 16 to 18 pounds. During the third week of August, some good catches were made in the Point Arena-Fort Bragg area where jigboats averaged 50 to 150 fish, mostly 9 to 11 pound albacore. Baitboats worked in the Destruction Island to Cape St. James area and off central Baja California. Baitboats were reported to have done well in the Pacific Northwest during the third week of August, and baitboats off central Baja California have been doing well since mid-August. San Diego sportboats continued to have good fishing success during the last 2 weeks of August. From August 16 to 25, catches were generally 1 to 2 fish per passenger, but from August 26 to 30 catches increased to nearly 4 fish per passenger as the sportboats fished 60 to 100 miles south of San Diego.

Staff of the Albacore Fisheries Program have been involved in processing and analyzing data collected during the 1976 cooperative NMFS-AFRF albacore research studies.

STOCK AND RECRUITMENT PROGRAM

Work Begun On Measuring Oxygen Consumption Of Pacific Mackerel Larvae

Dr. J. Hunter and Ms. C. Sanchez report that work began this month on measuring the oxygen consumption of Pacific mackerel larvae, using standard manometer equipment (Warburg respirometers) and techniques. These measurements are essential for estimating the quantities of food needed by larval mackerel to survive in the sea, and to evaluate the effect of food abundance on larval survival and recruitment. Preliminary measurements made this month indicate that larvae consume about 10.6 microliters of oxygen/mg dry weight/hour. This is about twice the rate of anchovy larvae and no doubt reflects in part the much greater swimming activity displayed by mackerel larvae.

Electivity Indices Calculated for Larval Fish Food Organisms

During the past year, 2 cruises have been made by Dr. E. Scura, Fishery Biologist at the La Jolla Laboratory, in the New York Bight to establish feeding criteria for larvae of commercially important fish larvae and to describe the spatial and temporal distribution of larval food organisms in the nearshore areas. The research strategy was to search for aggregations of possible food organisms at sea, collect samples of water from these areas, add laboratory grown larvae to the samples, and determine if they would feed and what kinds of food were eaten. At the end of the feeding experiment, the larvae were preserved for stomach content analysis. If the larvae initiated feeding this would give valuable clues as to the type and concentration of food organisms necessary to characterize an area as a suitable one for larval survival. Two species of larvae were used, the scup, Stenotomus chrysops, and the summer flounder, Paralichthys dentatus. The search for larval food organisms was made with a system consisting of a plankton pump and in situ particle counter. This system was used to profile the vertical distribution of particles in a size range that is compatible with the food requirements of post yolk-sac larvae. Sea water was collected from the pump at various depths and the most interesting samples were used for larval feeding experiments. All samples were preserved for future microscopic examination.

By ascertaining the species composition and concentration in the sea water and also the organisms found in the larval guts, Dr. Scura was able to calculate electivity indices for the various food organisms

(Ivlev, 1961). In general, he found that larvae avoid organisms with long spines like Ceratium sp. and Peridinium sp., even though they are of an appropriate size for the larvae and often found in fairly high concentrations (greater than 1/ml). The larvae are mildly attracted to dinoflagellates like Prorocentrum sp. and Dinophysis sp. and show a marked selectivity toward copepod nauplii. However, there appeared to be a food density threshold for nauplii. Larvae did not feed when the concentration of nauplii was below about 0.1 nauplii/ml (<100/L), but at higher concentrations, nauplii were readily preyed upon.

Dr. Scura calculated the number of calories consumed by the summer flounder larvae during the first cruise last year to see what percentage of the larvae had met their metabolic requirements based on present knowledge of feeding efficiency, gut clearance rate, and the metabolic requirements of the larvae. Only 0.3% of the larvae tested met their metabolic requirement in water off the New Jersey coast (very few flounder larvae were found there), whereas in control experiments where larvae were fed rotifers at a concentration of 5 organisms/ml, between 9 and 51% of those larvae met their metabolic requirements. This was a stormy period, and sampling was done over shelf waters. Mixing was heavy as shown by uniform chlorophyll distribution to the bottom.

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Fishery Biologist G. Theilacker and J. Metoyer, Biological Technician, continued a study to identify the histological and morphological parameters which are indicative of starvation in jack mackerel larvae. Daily for 10 days they measured the standard length, head length, eye diameter and body depth of fed and starved larvae maintained in containers of 2 different sizes. More than 200 larvae were measured; equal numbers of fed and starved specimens made up the sample.

Larvae grew faster and starved more quickly in large containers than in small ones. Within a container size, the standard length differed between starved and fed larvae. Statistical comparisons of relative body depth (body depth at pectoral/standard length) between starved and fed groups were significant for all length classes considered. Thus, according to Theilacker and Metoyer, body depth may be a useful indicator of starvation for jack mackerel larvae caught at sea.

NOAA Research Fellow Begins Project To Compare Morphological Condition of Anchovy Larvae in Good and Poor Years for Larval Survival

Dr. David Arthur, newly-appointed National Research Council/NOAA Research Fellow at the La Jolla Laboratory, began work on his research project in August to compare the morphological condition of anchovy larvae caught in notably good and poor years for larval survival. Condition factor, measured by the ratio of body height to length, has been shown to reflect the nutritional condition of larvae.

Preliminary results obtained by Dr. Arthur indicate that larvae captured within several miles of the beach are in a higher condition factor than larvae taken throughout the rest of the Southern California Bight. This trend was observed both in a poor year for larval survival (1965) as well as in a good year (1963), but it was much more apparent in the poor year.

The condition factor of larvae taken in offshore hauls was definitely higher in the good year (1963) than in the poor year (1965), whereas there was little difference in the condition of inshore caught larvae between the 2 years.

The relatively high condition factor of larvae from inshore hauls in the good year for survival was, however, considerably lower than that of larvae reared in the laboratory.

Significant Variations in Concentrations of Larval Fish Food Organisms Found at 20 M Depth Intervals

Working on samples obtained on plankton microdistribution cruises last March, Dr. R. Owen, Fishery Biologist at the La Jolla Laboratory, assisted by Vic Chow of Scripps Institution of Oceanography have found significant variations on the concentrations of a variety of larval fish foods (phytoplankton and small zooplankton) at 20 cm intervals of depth. These variations are presumably of great importance to the nutrition and subsequent recruitment of anchovy larvae, which require concentrations of particles often found only in microlayers embedded in the chlorophyll maximum zone of the upper thermocline. Within distances of less than 1 m, examples of up to six-fold variation in concentration have been found in the phytoplankton sector and up to ten-fold in the microzooplankton sector. Further analyses to document covariation of species and to convert the enumerations to larval food biomass were explored in August.

Assessment of vertical turbulent mixing, an important influence on the presence and degree of small-scale layering, was furthered with the help of Nancy Wiley, Computer Programmer at the La Jolla Laboratory. Shear flow was computed and plotted for the duration of the March cruise series by computer analysis of current meter records. The shear time series exhibits maxima and minima at approximately tidal frequencies, suggesting (provisionally) that tidal motions may be important in the control of layering and that small-scale layering may exhibit short-term variations in the availability of food rations to fish larvae.

ECOLOGY OF THE CALIFORNIA CURRENT

Population Estimates Made for Waning Years of Pacific Sardine Fishery

Mr. Alec MacCall, California Department of Fish and Game Biologist on detail at the La Jolla Laboratory, completed a draft of a paper entitled, "Population estimates for the waning years of the Pacific sardine (*Sardinops sagax caerulea*) fishery," which will be presented at the 1976 CalCOFI Conference in November. Expansion of the work to include population dynamics and management analyses, including simulation studies, delayed its completion. Major points of the analysis made by Mr. MacCall are as follows:

1) The new population estimates are in better agreement with independent indices of abundance (catch per unit effort, night-light surveys) than were previous estimates.

2) A decrease in the availability of 2 and 3 year-old fish occurred in the 1950's, possibly reflecting a more southerly origin of year-classes.

3) A purely functional description of the stock-recruitment relationship shows no curvature (density-dependent regulation) indicating little resilience to fishing.

4) The apparently poor rates of recruitment in the 1960's are likely to be the result of including southern fish in estimates of spawning biomass. The southern stock is not adapted to spawning in relatively cool waters; thus, recruitment rates of the remaining northern stock may have been quite average.

Simulations of the sardine population using observed spawning rates since 1932 were performed by Mr. MacCall. These simulations are optimistic in that they follow the functional stock-recruit model, and ignore any possible density-dependent effects which would have reduced the spawning rate at population sites larger than those observed. The simulations give the following management information:

1) The maximum continuous fishing mortality rate which the sardine population could have sustained is 0.25. This is equivalent to a 22% annual rate.

2) The simulated population was able to sustain a constant quota of 300,000 MT, but was seriously depleted by a 350,000 ton quota. Due to the instability involved by such a constant harvest and the optimistic nature of the simulation, maximum sustainable yield (MSY) for the sardine fishery was probably about 250,000 tons.

3) This MSY is 60% smaller than the Gulland potential yield formula would have estimated:

$$\begin{aligned} 1/2 MB_0 &= 0.5 \times 0.4 \times 3.2 \text{ million metric tons} \\ &= 640,000 \text{ tons} \end{aligned}$$

4) Extending, by analogy, this difference to potential yield estimates for the northern anchovy (Engraulis mordax), Gulland's potential yield estimates of 1 to 2 million MT are reduced to 400,000 to 800,000 MT. The latter range is reasonable in view of the recently developed logistic model of anchovy growth which predicts an MSY of approximately 450,000 tons.

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James Zweifel, Mathematician at the La Jolla Laboratory, has completed a manuscript on allometry in larval fishes. The analysis of laboratory and field data reveals that the equation of simple allometry $\ln y = a + b \ln x$ is inadequate for describing either length-weight or morphometric relationships except in very limited age ranges. The paper develops an equation based on the Gompertz growth model which can be used for describing these relationships even when age is unknown. The model, based on continuously changing growth rates, implies that indexes such as the condition factor W/L^3 are age or size specific.

The many important uses of this model include fitting length-weight relationships and assessment of the degree of starvation in anchovy and jack mackerel larvae from measurements of body depth.

Oceanic Fisheries Resource Division

TUNA RESOURCES PROGRAM

Paper on Environment and Catch Completed

Messrs. Forrest Miller, Meteorologist with the Inter-American Tropical Tuna Commission and Richard Evans, Oceanographer of the La Jolla Laboratory, have completed a manuscript entitled, "The ocean environment of the eastern tropical Pacific as related to purse seining." The study uses some 3,000 XBT observations collected by purse seiners on the fishing grounds to derive statistically the relationships between several environmental variables and the catch of tunas.

Application of a number of statistical techniques by the authors demonstrated that variability in both space and time and among boats were major factors that tended to mask the effects of the environment. When those effects were removed by averaging the data for each boat over a set area and time span the environmental variables explained

some 40% of the variance in the averaged catch. This manuscript will soon be sent to reviewers.

Tuna Vessels Continue Participation in FAX Program

During August of 1976, 22 U.S. tuna seiners participated in the FAX program of the La Jolla Laboratory. Reporting rates during this month were down from June 1975 by 18%, as shown below:

August Reporting Rates

	Weather Observations	XBT Observations	Total	Total Year-to-Date
1975	268	38	306	2,809
1976	225	25	250	2,004
Percent change	-16.0	-34.0	-18.0	-28.6

Congratulations to the master and crew of the fishing vessel, Mermaid, who led cooperating vessels by radioing 24 weather observations to the Southwest Fisheries Center in August.

PORPOISE/TUNA PROGRAM

Estimates Made of Porpoise Mortality for First Seven Months of 1976

Mr. John Everett, Manager of the Porpoise/Tuna Interaction Program at the La Jolla Laboratory, recently reported that between 33,000 and 57,000 porpoise were killed incidental to tuna purse seining in the first 7 months of 1976. These figures represent the limits of an approximate 95% confidence interval surrounding a point estimate of 45,000.

If the porpoise kill per ton of yellowfin tuna for the first 7 months (0.91) remains constant for the rest of the year, about 70,000 porpoise will be killed in 1976. If the kill per ton outside the Commission Yellowfin Regulatory Area (CYRA) is as that encountered by 2 complete and 4 incomplete trips (1.33), the quota could be reached during the last few months of the year.

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The last of the tuna seiners carrying a Bold Contender experimental gear system and taking part in the original study landed in San Diego at the end of August. The overall porpoise kill per porpoise set for the 10 cruises is 6.5 with a kill per ton of yellowfin tuna of 0.33.

The fleet averages for these statistics presently stand at about 13 kill per set and a 0.90 kill per ton.

SWFC Scientists Attend Bergen Meeting on Marine Mammals

Southwest Fisheries Center participants to the meeting on marine mammals, which opens August 31 in Bergen, Norway for 2 weeks include Drs. William Perrin and Paul Smith. The meeting is being convened by the Working Party on Marine Mammals of the U.N.'s Food and Agriculture Organization, Advisory Committee on Marine Resources Research, with the assistance of the U.N. Environmental programme. It is the last stage of a 3 year project to make an independent critical appraisal of the status of marine mammals on a worldwide basis. The final report, based on the reports of some 22 working groups, is intended to cover the identity, distribution and status of stocks of marine mammals which are, have been, or might soon be subject to exploitation by man, killed accidentally when fishing for other marine living resources or which are affected by other human activities.

Porpoise Observers Collect Weather Data

Early in August Richard Evans, Oceanographer at the La Jolla Laboratory, instructed 13 new porpoise observers in the procedure for collecting marine weather data. This data will help to supplement the data presently being radioed to station WWD, a U.S. Department of Commerce-licensed radio station, by cooperating purse seiners. The extensive data base to which the data collected by porpoise observers will be added is currently being used by the U.S. Navy, the National Weather Service, the National Climatic Center and researchers at the Southwest Fisheries Center.

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TIBURON LABORATORY

COASTAL FISH COMMUNITIES INVESTIGATIONS

Tiburon Laboratory Scientists Participate in Pilot Rockfish Survey at Monterey

Dr. William Lenarz, Leader of the Rockfish Analysis Task, and Fishery Biologist Peter Adams, participated in the Monterey component of the Northwest Fisheries Center's pilot rockfish survey. Three vessels participated in the survey: NOAA's John Cobb, and the chartered fishing vessels Pat San Marie and Pacific Raider. John Cobb sampled randomly selected benthic grids with a bottom trawl, Pat San Marie collected

acoustic data (processed on board with a PDP 11/45 computer) with a towed body containing narrow and wide beam 38 kHz transducers, and Pacific Raider samples concentrations of fish in the water column, located by the acoustic survey, with a midwater trawl equipped with a net sounder, Lenarz and Adams will use these data, and data collected by a similar survey in Queen Charlotte Sound, B.C., in September to design a coastwide survey of rockfish scheduled for 1977.

Investigation Member Participates in Taxonomic Standardization Program

Mr. Tony Chess, Fishery Biologist with the Coastal Fish Communities Task, is participating in the Taxonomic Standardization Program, coordinated by the Coastal Water Research Project. This program intends to meet the need for more uniform procedures in taxonomic identifications of organisms sampled in ecological studies. This is a basic requirement for coordinating the results of the many biological surveys now being made along the west coast. A publication "Proceedings of the taxonomic standardization program" summarizes the results of each meeting.

PHYSIOLOGY INVESTIGATIONS

Modifications to Sea Water System Completed at Tiburon

Mr. Tom Yocom, Fishery Biologist, and Mr. Jeff O'Neill, Biological Technician, completed necessary modifications to the sea water system during this month. All intake pipes were cleaned, a new pump was installed, the salinity control unit was recharged with 25 tons of salt, and temperature control equipment and new bulbs for the UV-sterilizer were ordered. Mr. O'Neill and Mr. Yocom also built an apparatus for dissolving the water soluble fraction of crude oil in sea water. The design is a modification of an apparatus built by Mr. Steve Krugel and Dr. Steve Klein of the University of California at Berkeley.

Dr. Stan Rice of the Auke Bay, Alaska Fisheries Laboratory visited the Tiburon Laboratory during the preliminary testing of the apparatus and indicated his intention to build a similar system at Auke Bay. Dr. Rice kindly provided Mr. Yocom and Mr. O'Neill with 5 gallons of Cook Inlet crude oil, enabling them to begin preliminary analysis of the effectiveness of the apparatus.

Arrangements were made with Mr. Bob Tasto of the California Department of Fish and Game to acquire approximately 1,000 juvenile starry flounder for experiments. Necessary modifications of the facilities in the wet laboratory are being made for holding and acclimating these fish when they arrive in mid-September.

Mr. Yocom continued a literature review and search (with the help of Librarian Maureen Woods) of information on the analysis, background level, and biological effects of the water soluble fraction of crude oil in the marine environment.

Sources of Early Mortality in Striped Bass Investigated

Dr. Jeannette Whipple, Chief, Physiology Investigations, reports that with laboratory experiments completed on striped bass, work is now centered on measuring preserved specimens, making caloric determinations, and summarizing data. A summary data sheet was designed and printed which will include all data from the experiments. These will be key punched onto computer cards and processed with a sequence of programs designed to test for significant relations between dependent and independent variables.

Although analysis of data is just beginning, Dr. Whipple and her associates have found that striped bass have a large amount of energy available for early development. Newly fertilized eggs had a mean individual dry weight of 270 mg and contained 3.99 calories/egg. This is considerably more energy than has been found in other species. For instance, the sardine has approximately 0.3 calories/egg and smallmouth bass 2.3 calories/egg. One distinct feature of the striped bass egg is the large oil globule which persists for a long period of time in the yolk sac larvae. The high energy content of the oil most likely accounts for the ability of striped bass larvae to withstand starvation up to 30 days. The larvae at hatching average 4.6 mm in standard length and weighed 262 mg, only slightly less than the original egg weight.

COASTAL FISHERIES INVESTIGATIONS

Final Preparations Made for Jordan Cruise

Final preparations are being made for Cruise 105, Leg 5 of David Starr Jordan. The ship will leave Tiburon on September 5 and end the cruise in San Diego on September 17. Primary objective of the cruise is to explore commercial potential of deep trawling grounds off central and southern California. Cruise Leader Susumu Kato reports that 23 fishermen and processors from Morro Bay, Avila Beach, Santa Barbara, and San Diego will participate in the cruise. Researchers from the California Department of Fish and Game, Scripps Institution of Oceanography, California Academy of Sciences, Santa Barbara Natural History Museum, Sea Grant, Western Washington College, Naval Undersea Center and NMFS will be aboard the Jordan to observe operations.

In addition to trawling, vertical longline and traps will be used to catch fish and invertebrates such as crab and shrimp.

Silver Salmon Rearing Project Delayed

Mr. Roger Green, Leader, Recreational Fisheries Improvement Task, reports that an outbreak of furunculosis at the Mad River hatchery has delayed delivery of silver salmon being raised to smolt stage there for the Tiburon Laboratory. At month's end the fish had responded well to treatment after suffering a loss of approximately 4,000 fish out of 69,000. Mr. Green expects to take delivery the first week or so in September. The growth of these fish has slowed and they will have to be moved from the hatchery to the salt water pens at Tiburon somewhat below optimal size for introduction into salt water. The average size at smolting (salt water adaptability) increases with decreasing photoperiod so in the fall of the year, there would be little point in holding them in fresh water any longer.

An experiment is planned to ascertain if adjusting the photoperiod with flood lights after introduction to salt water has any effect on parr reversals and survival. A portion of the fish will be housed in salt water tanks for the experiment.

Returning silver salmon from the 1975 release began appearing at the pen site early this month. Of 49 fish caught with a gill net in seven overnight sets, three have Tiburon Laboratory tags. Also recovered were two tags from the Cooperative Sea Grant Tomales Bay project--one from the net and one sport-caught in the same locality. The return of these last two fish to the Tiburon pen area was quite unexpected. The Tomales fish were delivered here from the hatchery in August 1975, but were moved to Tomales a week later and reared there for 3 to 4 months before release in Tomales Bay.

Sixteen of the NMFS tags were returned from the ocean and San Francisco Bay during the last month. The greatest distance traveled was from Coos Bay, Oregon. Perhaps the most unusual tag recovery was from a lady who found her tag in a salmon portion served to her in a Fort Bragg restaurant. The plastic tag she returned was slightly broiled around the edges but still readable.

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Angler's Guide to the U.S. Pacific Coast - Galley Layout Submitted to Printer

Early in the month, authors Jim Squire at La Jolla and Susan Smith at Tiburon returned the galley page layout of the Guide to NMFS' Scientific Publications Staff in Seattle, after making some minor corrections. On August 16, the layout and corrected galleys were sent by SPS to the printer, who has already started work on color proofs of the 40 coastline fishing charts.

The Angler's Guide is a special NMFS publication that describes marine game fish, fishing grounds, and angler facilities along the U.S. west coast from California to Alaska, and around Hawaii, American Samoa and Guam. Distribution is expected this fall.

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Fishing Methods Chronology - Second
Draft Submitted

Ms. Susan Smith reports that work continues on the chronology of changes in recreational fishing tackle and methods in California since the turn of the century. A second draft of the chronology was submitted for typing. Copies of this draft will be sent out for review.

PUBLIC RELATIONS

Scientific Illustrator Tamotsu Nakata set up a display, in August, of the Honolulu Laboratory's research activities at the Windward Fair.

Mr. Cort W. Kloke, Project Assistant, coordinating the Research Methodology for Fishfarm Management Studies, sponsored by the East-West Center, accompanied a group of 15 participants (mostly from the Southeast Asian countries) to the library at the Honolulu Laboratory on August 16 for an orientation tour.

August 24 - Messrs. David Kramer and John Everett spoke to members of the Sierra Club. Mr. Kramer discussed the fisheries research at the Center and Mr. Everett spoke on the porpoise program, particularly the efforts currently underway both by the Government and the tuna industry to decrease the kill of porpoise.

HONORS AND AWARDS

		<u>Laboratory</u>
August 2	- R.M. Laurs, Quality Step Increase	La Jolla
	- David Mackett, Quality Step Increase	La Jolla
	- Eric Barham, Quality Step Increase	La Jolla
	- Richard McNeeley, Quality Step Increase	La Jolla
29	- Marleen DiBona, Quality Step Increase	La Jolla

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CHARLES WARNER FORSTER

March 21, 1922-August 22, 1976

IN MEMORIAM

For almost 22 years, Charles Forster served the National Marine Fisheries Service as the Captain, first of the converted schooner, Black Douglas, and later as the first captain of the NOAA research vessel, David Starr Jordan.

In 1954, the U.S. Department of the Interior's Fish and Wildlife Service returned the research vessel, Black Douglas, which had been mothballed in San Francisco, to active service in the cooperative investigation of the pelagic fish resources of the California Current. Captain Forster, a U.S. Navy World War II veteran, with 9 years experience in the commercial tuna fleet, was selected as the master of the Douglas, thus entering the service of the federal fisheries agency which he served faithfully until his recent death.



During the ensuing years, Captain Forster participated in more than 200 research survey cruises that ranged the U.S. west coast and the eastern Pacific. In 1965, he took command of the newly-built research vessel, David Starr Jordan, in Sturgeon Bay, Wisconsin, and sailed her to her home port in San Diego.

Scientists and technicians of the La Jolla Laboratory who worked at sea with Captain Forster knew him as an experienced and skilled seaman, a man whose overriding concern was always the safety and well-being of his crew and ship. He was a strong and quiet man who maintained a keen interest in the scientific research of the laboratory, and who subsequently developed improved gear and techniques to facilitate the gathering of biological and oceanographic data at sea.

Perhaps the best tribute his long-time friends and colleagues at the Southwest Fisheries Center can pay to Captain Charles Forster is to remember the productive and successful record he established in carrying out the scientific mission of the Center with honor and integrity.

Married for 34 years to the former May Jane La Montagne, Captain Forster is also survived by two children, Daniel W. Forster with the Peace Corps in the Philippines, and Mrs. Susan Lynn Quick of San Diego.

MEETINGS AND TRAVEL

Southwest Fisheries Center

- July 30 - Laboratory Director Richard Shomura spent some time in Hilo with Mr. Rex Matsuno, Suisan Co., Ltd., and local fishermen who had problems with burnt tuna. Mr. Shomura commented that the burnt condition in the flesh of yellowfin tuna was due to inadequate refrigeration of the catch.
- 31 - Mr. Shomura and Dr. Wetherall participated in a meeting in Kailua-Kona to review extended jurisdiction law as it related to the work of the Honolulu Laboratory. The meeting was held as part of the annual Hawaiian International Billfish Tournament (HIBT).
- August 1 - Mr. Shomura and Dr. Wetherall returned to Honolulu after attending the HIBT workshop and the awards banquet the day before.
- 3-9 - Mr. Pete Benville of the Tiburon Laboratory traveled to Alaska Science Conference at the University of Alaska at Fairbanks. Prior to returning to Tiburon, Mr. Benville visited the Auke Bay Fisheries Laboratory to discuss crude oil analytical techniques with Sid Korn, John Karinen and Loren Cheatham.
- 4-6 - Planning Officer David Mackett in New York to attend U.S./Mexico fishery negotiations.
- 5 - Mr. Shomura and Mr. Robert Iversen, Regional Representative, Southwest Region, held an extended jurisdiction meeting with State Fish and Game personnel (Messrs. M. Takata and H. Sakuda).
- 5-6 - Dr. M. Laurs, Leader of the Albacore Fisheries Program, La Jolla Laboratory, traveled to Monterey, California, to consult with personnel of the Pacific Environmental Group concerning albacore-oceanography studies.
- 6 - Acting Center Director Izadore Barrett in Terminal Island to discuss aspects of extended jurisdiction.
- Another extended jurisdiction meeting was held; Mr. Shomura and Dr. Wetherall participated.

- Mr. Y. Munechika, manager, Bumble Bee Seafoods, Tokyo visited with Messrs. Otsu and Shomura.
- 6-27 - Mr. Pete Adams of the Tiburon Laboratory traveled to Monterey to participate in a cruise on the Pacific Raider.
- 8-13 - Mr. Tom Yocom of the Tiburon Laboratory attended a symposium, in Washington, D.C., on sources, effects, and sinks of hydrocarbons in the aquatic environment. A number of papers were pertinent to the oil research at Tiburon. Mr. Yocom also had the opportunity to discuss specific experimental design problems with a number of outstanding biologists and chemists at the symposium.
- 8-11 - Acting Center Director Izadore Barrett in Honolulu to attend a meeting with Honolulu Laboratory Director Richard Shomura and Dr. Lee Alverson, Director of the NMFS Northwest Fisheries Center, in a discussion on marine mammals.
- 9 - Mr. Shigetoshi Tashiro, Dr. Kazuo Fujino's (Dr. Fujino was formerly a geneticist at the Honolulu Laboratory) undergraduate student at the Laboratory of Fish Physiology, Kitasato University in Japan, visited the Laboratory and spoke briefly with Messrs. Heeny Yuen and Thomas Hida. Mr. Tashiro revisited the laboratory on August 11 to pay a brief courtesy call on Mr. Shomura. Mr. Tashiro is presently aboard the Fuji Maru.
- 8-11 - Mr. David Mackett traveled to Seattle, Washington and Portland, Oregon to attend the NMFS Planning Procedures meeting and a coast-wide Data System meeting.
- 9-11 - Mr. Barrett in Honolulu for discussions on marine mammals.
- 10 - The NWHI meeting was held with a number of representatives of agencies interested in the NWHI participation. In addition to representatives from the State (M. Takata, Fish and Game; H. Pennington, Marine Affairs Coordinator's office), U.S. Fish and Wildlife Service (P. Sekora) and Laboratory personnel, participants included I. Barrett of the SWFC and D. L. Alverson and G. Harry of the NWFC.
- 10-27 - Dr. William Lenarz of the Tiburon Laboratory traveled to Monterey to participate in a cruise on the Pat San Marie.

- 11 - Dr. Reuben Lasker, Leader of the Coastal Fisheries Resource Division, attended a Sea Grant Advisory Committee meeting at Scripps Institution of Oceanography where he addressed the group on research in progress at the Southwest Fisheries Center.
- 11-12 - Mr. Robert F. Scott, NMFS, Washington, D.C., visited the laboratory and met with Mr. Shomura and Dr. Wetherall on extended jurisdiction matters.
- 12 - Mr. Shomura and Dr. Dizon departed Honolulu to spend Friday (August 13) at the Tiburon Laboratory to discuss with Dr. Jeannette (Struhsaker) Whipple and Dr. Reuben Lasker details of a long-term project involving pelagic fishes for the Deep Ocean Mining Environmental Study (DOMES) program. Drs. Dizon and Whipple visited the Bodega Bay Laboratory to inspect the Environmental Research Laboratory's (ERL) equipment for possible use by us. Mr. Shomura devoted the week of August 16-20 to orientation, briefings, and other preparations for drafting the DOMES Preliminary Environmental Guidelines (PEG) at the task force meeting. The following week (August 23-26) Mr. Shomura devoted his time with the other task force members to the actual drafting process. Mr. Shomura returned to the laboratory on August 27. During his absence, Dr. Paul Struhsaker served as the Acting Laboratory Director, August 12-27.
- 13 - Dr. Fujino who was en route home to Japan from meetings in Dublin and Seattle met with Dr. Struhsaker to discuss work with skipjack otoliths. Dr. Fujino indicated he would like to do studies on geographical variation in growth rates of the Pacific populations, a study already begun by Dr. Struhsaker and Mr. Uchiyama. Dr. Fujino also requested 5 g samples of pyloric caeca and livers from a series of central Pacific skipjack tuna.
- 15-18 - Mr. Susumu Kato traveled to San Diego to install equipment on the Jordan for the September cruise. Trawl gear borrowed from the California Department of Fish and Game was also picked up and delivered to the Jordan.
- 17-19 - Dr. G. Stauffer traveled to Terminal Island to attend a Coast Guard/NMFS meeting on compliance for extended jurisdiction.

- 18 - Acting Center Director Izadore Barrett traveled to Tiburon Laboratory to meet with Mr. N. Abramson, Laboratory Director, and staff regarding general center affairs.
- Mr. Perry Allen, NMFS, Washington, D.C.; Lt. Roger Cook, USCG, Washington, D.C.; and Cdr. Robert Morhard, USCG Pacific Area, San Francisco, met briefly with Acting Laboratory Director Paul Struhsaker before attending an extended jurisdiction meeting arranged by Mr. Iversen. Dr. Wetherall and local USCG representatives from District-Legal and Operations also attended the meeting.
- 19 - A bi-weekly keeping-current extended jurisdiction meeting was held. Drs. Struhsaker and Wetherall attended the meeting.
- 22-31 - Dr. Jeannette Whipple traveled to Alaska to attend hearings dealing with the outer continental shelf oil development in lower Cook Inlet. She also talked with scientists in Anchorage at the AEIDC, OCS Data Center, Alaska Fish and Game, and EPA, and in Juneau and Auke Bay at the NMFS Auke Bay Laboratory and Regional Office.
- 24 - Dr. Struhsaker represented Mr. Shomura at the Pacific Islands Fisheries Development Committee meeting held at the State Capitol. Discussions centered around the long-range planning and the staffing requirements for PTDF and the PIFDC.
- Mrs. Mary Lynne Godfrey and Mr. Uchida attended the 1977 Honolulu Area Combined Federal Campaign kick off luncheon at the Commissioned Officers' (Open) Mess, Pearl Harbor. Mrs. Godfrey has been named Commerce Agency Chairperson for the campaign. In this capacity she coordinates the CFC efforts of all Commerce Department agencies in the Honolulu area for this year's charitable fund drive.
- 26 - Dr. Struhsaker represented Mr. Shomura at a meeting called by Mr. Howard Pennington, Acting Marine Affairs Coordinator for the State of Hawaii, to get together a select group of individuals concerned with the marine mammals of the Hawaiian archipelago for the purpose of considering ways in which the State might help preserve and encourage the vital species. Mr. Iversen also attended the meeting.

VISITORS

La Jolla Laboratory

- August 3 - Ronald Weidenback, Fishery Scientist, University of Michigan, presently involved in the Mekong Basinwide Fishery Study under the auspices of the United Nations.
- 9 - Hermine Davis, NOAA Finance Office, Rockville, Maryland.
- Edward Assaf, NOAA/MESA, Stonybrook, New York.
- 12 - Craig Cary, Florida Institute of Technology, Melbourne, Florida.
- 18 - Harold J. Barnett, NMFS, PURC, Seattle, Washington.
- 19 - Jesus A. Aguilar Montoya, Instituto Oceanologico del Pacifico, Mazatlan, Mexico.
- 20 - Hilary Teacheliol of Micronesia, Deputy District Administrator of Yap, visited the Center as a participant in the International Visitor Program of the U.S. Department of State. Mr. Tacheliol was accompanied by Mr. Slator Balckiston, an escort assigned by the State Department.
- 26 - Mario Jacombe, Escuela de Pesca, Manta, Ecuador.
- August 30-
September 2 - W. Pete Jensen of the Marine Mammals and Endangered Species Division, NMFS Washington, and Martin Hochman, NOAA Staff Attorney.

Tiburon Laboratory

- August 2 - Floyd Nudi, U.S. Fish and Wildlife Service, Albuquerque, New Mexico.
- 4 - Warren Shaul and Larry Six, Pacific Marine Fisheries Commission, Portland, Oregon.
- 5 - Robert Preble Huffer, SIO, La Jolla, California.
- 9 - Zeke Grader, Pacific Coast Federation of Fishermen's Association, Sausalito, California.

- 10 - Frank Dyer, San Francisco Tyee Club,
San Francisco, California.
- Chris Dewees, Sea Grant Marine Advisory Program,
University of California, Davis, Davis, California.
- 11 - Richard Morat, U.S. Fish and Wildlife Service,
Sacramento, California
- 13 - Richard Shomura and Andy Dizon, NMFS, Honolulu
Laboratory, Honolulu, Hawaii.
- Reuben Lasker, NMFS, La Jolla Laboratory,
La Jolla, California.
- 16 - J. Mullick, U.S. Coast Guard, Pacific Area,
San Francisco, California.
- 17 - Tom Collins, South Carolina State College, Co-op
Education and Placement Center,
Orangeburg, South Carolina.
- Stan Rice, Auke Bay Fisheries Laboratory,
Auke Bay, Alaska.
- 25 - Phyllis Barusch, IGS, University of California,
Berkeley, Berkeley, California.
- 27 - Malcolm Donald, Societe Atlantique de Mariculture,
Portola Valley, California.

PERSONNEL

			<u>Laboratory</u>
August	2	- Nancy Wright, Clerk Typist, Appointment (PT).	La Jolla
	18	- John Gilbert, Programmer, Resignation.	La Jolla
	26	- Michael Klicpera, Summer Aid, Resignation.	La Jolla
	27	- Hilary Hogan, Physical Science Aid, Resignation.	La Jolla
		- Edmond Ciarnello, Mathematics Technician, Resignation.	La Jolla
	29	- J. Anita Coit, Administrative Assistant, Promotion.	La Jolla
	29	- John Butler, Fishery Biologist, Appointment (PT).	La Jolla
	29	- Jeannette Struhsaker, name change to Jeannette Whipple.	Tiburon

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